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PH1800-GFP

Operator's Guide

PowerHub 1800

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PowerHub 1800

Operator's Guide

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About This Guide

Purpose

The purpose of this Operator's Guide is to provide procedures for operating the PowerHub 1800.

Scope

The Guide provides safety guidelines, detailed planning and setup information, and procedures for operating the inverter. It does not provide operational or troubleshooting information. It does not provide details about particular brands of batteries. Consult individual battery manufacturers for this information.

Audience

The PowerHub is an entry-level inverter system. This Guide is intended for anyone who needs to operate the PowerHub 1800. Permanent installations should be done by certified technicians or electricians. Installers should have adequate knowledge of national and local electric code to ensure code-compliance by inspection from the local electric authority.

Organization

This Guide is organized into three chapters and one appendix.

Chapter 1 describes the operational features and functions of the PowerHub 1800. This section details how the unit functions as an inverter, provides information on the control panel, and describes operating limits for inverter operation.

Chapter 2 contains information on operating the PowerHub 1800.

Chapter 3 explains how to troubleshoot the PowerHub 1800 and describes the error codes that may be displayed on the LCD.

Appendix A provides electrical and physical specifications for the PowerHub 1800.

Abbreviations and Acronyms

| Abbreviation or Acronym | Definition |
|-------------------------|---|
| A | Amps |
| AC | Alternating Current |
| DC | Direct Current |
| ft-lbs | Foot-pounds (a measure of torque) |
| kW | Kilowatts (1000 watts) |
| LED | Light Emitting Diode |
| Nm | Newton-meters (a measurement of torque) |
| PV | Photovoltaic |
| RE | Renewable Energy |
| Vac | Volts AC |
| Vdc | Volts DC |
| W | Watts |

Related Information

You can find more information about this product by seeing the PowerHub 1800 Installation Guide (part number 975-0289-01-01). You can find more information about Xantrex products and services at **www.xantrex.com**.

A French version of the document (part number 975-0291-01-01) and a Spanish version (part number 975-0289-03-01) are available at **www.xantrex.com**.

Important Safety Instructions

READ AND SAVE THIS OPERATOR'S GUIDE FOR FUTURE REFERENCE.

This guide contains important safety instructions for the PowerHub 1800 that must be followed during installation, operation, and troubleshooting.

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, can result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, can result in moderate or minor injury.

NOTICE

NOTICE indicates a potentially hazardous situation, which, if not avoided, can result in equipment damage.

Important: These notes describe things which are important for you to know, however, they are not as serious as a caution or warning.

Safety Information

1. **Before installing and using the PowerHub, read all instructions and cautionary markings on the PowerHub, the batteries, and in both this Installation Guide and the Operator's Guide.**
2. The PowerHub is intended for indoor use only. Do not expose the PowerHub to rain, snow, or spray. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the PowerHub in a zero-clearance compartment. Overheating may result.
3. The PowerHub may connect to as many as three sources of DC Power and one source of AC Power. To reduce the risk of electrical shock, disconnect all sources of AC and DC power from the PowerHub before attempting any maintenance or cleaning or working on any circuits connected to the PowerHub. Turning off controls will not eliminate this risk.
4. Use only attachments that are intended for use with this product. Doing otherwise may result in a risk of fire, electric shock, or injury to persons.
5. To avoid a risk of fire and electric shock, make sure that all of the installation wiring is in good condition and that wire is not undersized. Do not operate the PowerHub with damaged or substandard wiring.
6. Do not operate the PowerHub if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the PowerHub is damaged, see the Warranty section.
7. Do not disassemble the PowerHub, except where noted to wire it for a permanent installation. The PowerHub 1800 contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the PowerHub yourself may result in a risk of electrical shock or fire and will void your warranty. Internal capacitors remain charged after all power is disconnected.
8. The PowerHub must be provided with an equipment-grounding conductor. Grounding and all other wiring must comply with National and local codes and regulations.
9. The PowerHub 1800 is not intended for use as an uninterruptible power supply (UPS).

⚠ WARNING

RISK OF CARBON MONOXIDE POISONING

Do not use generators indoors. When generators are used outdoors there must be sufficient circulation to vent the carbon monoxide.

Failure to follow these instructions can result in death or serious injury.

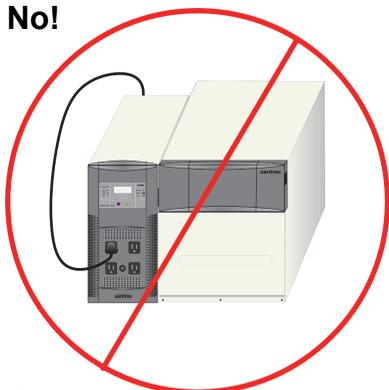
⚠ WARNING

LIMITATION ON USE

The PowerHub 1800 is not intended for use in connection with life support systems or other medical equipment or devices.

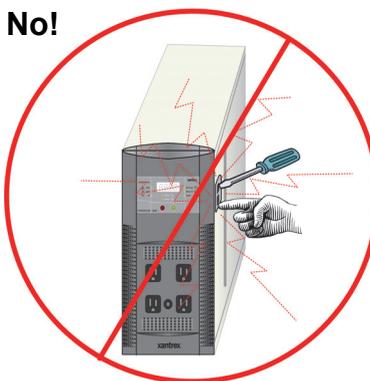
Failure to follow these instructions can result in death or serious injury.

No!



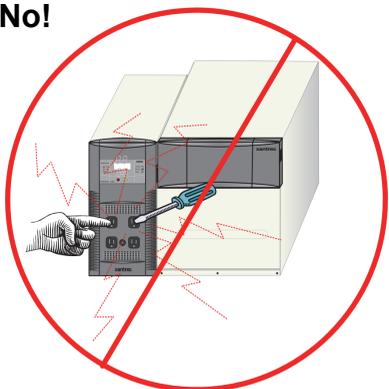
Do not plug input cord into output socket.

No!



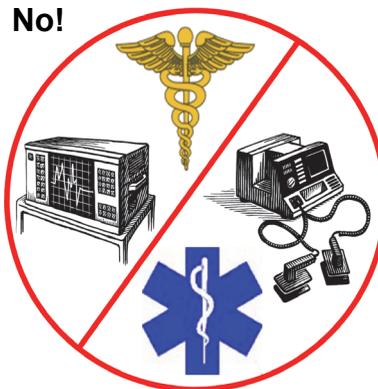
Do not pry.

No!



Do not insert objects into the socket.

No!



See Limitation On Use.

Figure i Basic Safety

Precautions for Using Batteries

WARNING

BURN FROM HIGH SHORT-CIRCUIT CURRENT, FIRE AND EXPLOSION FROM VENTED GASES HAZARDS

- Always wear proper, non-absorbent gloves, complete eye protection, and clothing protection. Avoid touching your eyes and wiping your forehead while working near batteries. See note #13.
- Remove all personal metal items, like rings, bracelets, and watches when working with batteries. See notes #8 and #9 below.
- Never smoke or allow a spark or flame near the engine or batteries.

Failure to follow these instructions can result on death or serious injury.

NOTES:

1. Use only SEALED batteries with the PowerHub 1800.
2. Follow all instructions published by the battery manufacturer.
3. Working in the vicinity of batteries may be dangerous. Unsealed batteries can generate explosive gases during normal operation. Therefore, you must read this guide and follow the instructions exactly before installing or using the PowerHub.
4. This equipment contains components which tend to produce arcs or sparks. To prevent fire or explosion, do not install the PowerHub in locations that require ignition-protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, as well as joints, fittings, or other connections between components of the fuel system.
5. To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer.
6. Make sure that nothing is blocking the air vents on the back of the enclosure.
7. Never smoke or allow a spark or flame near the batteries.
8. Use caution to reduce the risk of dropping a metal tool on the batteries. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
9. Remove all personal metal items, like rings, bracelets, and watches when working with batteries. Batteries can produce a short circuit current high enough to weld metal, causing a severe burn.

10. Have someone within range of your voice or close enough to come to your aid when you work near a battery.
11. Wear complete eye protection and clothing protection. Avoid touching your eyes while working near batteries.
12. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
13. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.
14. Use battery over-current protection such as a DC fuse or DC breaker.

Precautions for Using Rechargeable Appliances

NOTICE

EQUIPMENT DAMAGE

This equipment produces a modified sine wave output. Equipment damage may occur if the rechargeable appliance is not designed to use modified sine wave output. If you are unsure about using your rechargeable appliance with the modified sine wave, contact the equipment manufacturer.

Failure to follow these instructions can damage connected equipment.

Most rechargeable battery-operated equipment uses a separate charger or transformer that is plugged into an AC receptacle and produces a low voltage charging output.

Some chargers for small rechargeable batteries can be damaged if connected to the PowerHub. Do not use the following with the PowerHub:

- Small battery-operated appliances like flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.
- Some chargers for battery packs used in power hand tools. These affected chargers display a warning label stating that dangerous voltages are present at the battery terminals.

FCC Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Power Down Procedure

The power down procedure will be depend on how the unit has been installed. If using the AC cord to plug the PowerHub directly into a generator, this is referred to as “softwiring” or “plug-and-go”. If installing in a permanent location, that is referred to as “hardwiring”.

If softwired.....

To Power Down the PowerHub 1800:

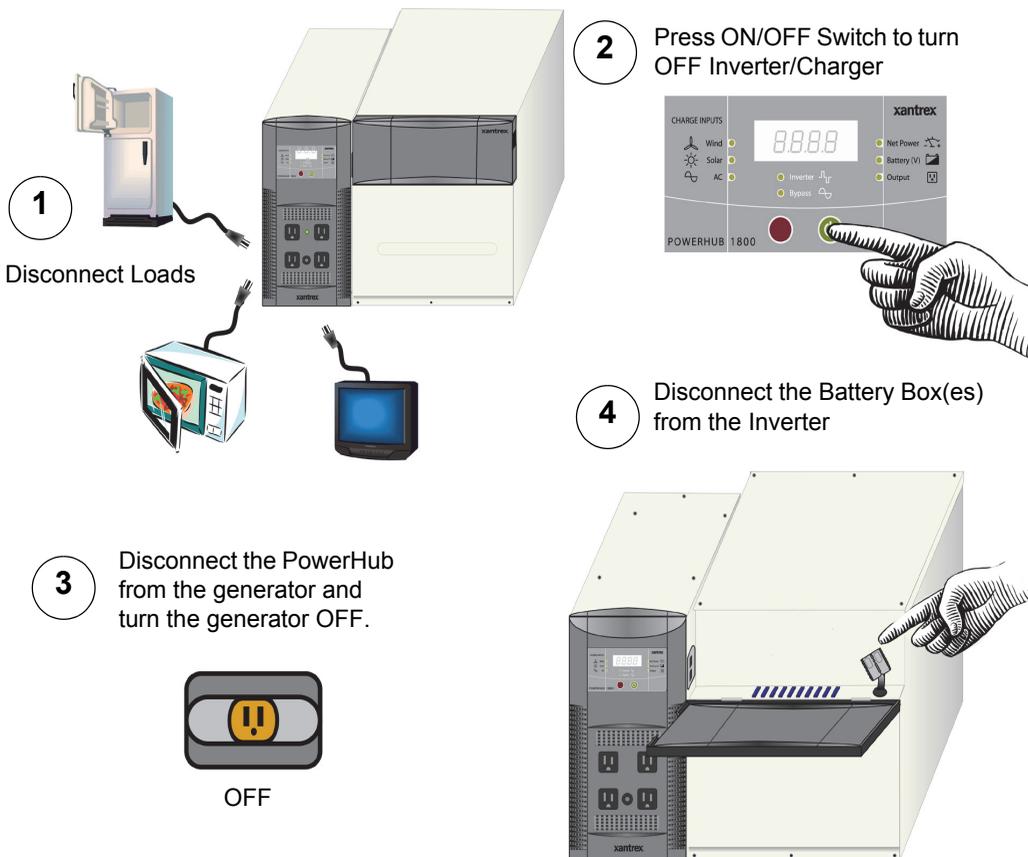


Figure ii Power Down Procedure for Softwired Installations

If hardwired..... **To Power Down the PowerHub 1800:**

⚠ WARNING

ELECTRIC SHOCK HAZARD
Physically disconnect DC input sources (solar or wind) to ensure that DC power is OFF.
Failure to follow these instructions can result in death or serious injury.

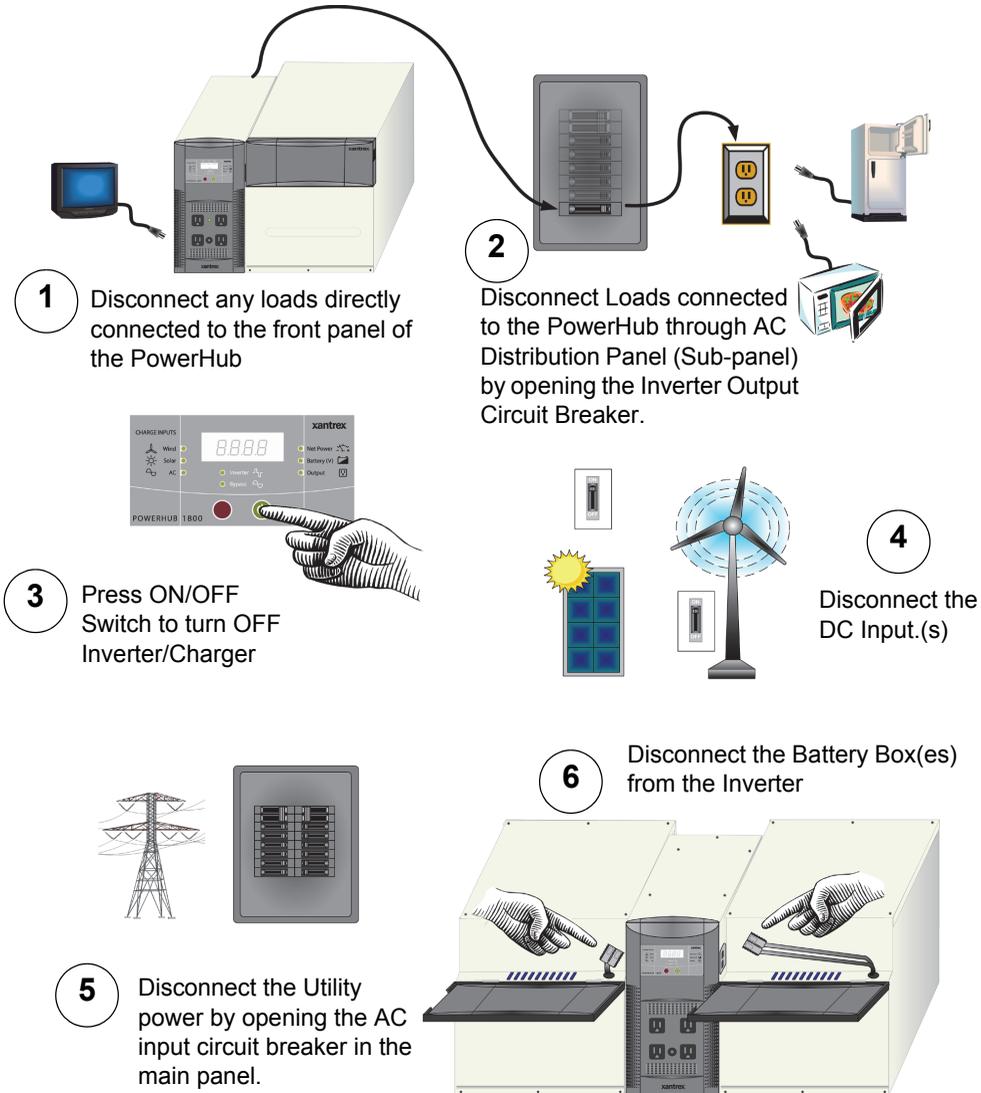


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1

Introduction

Chapter 1 describes the operational features and functions of the PowerHub 1800. This section details how the unit functions as an inverter, provides information on the control panel, and describes operating limits for inverter operation.

| For this topic... | See... |
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Introduction

Thank you for your purchase of this Home Power System. The modified sine wave AC output from the inverter ensures AC loads operating from the unit perform efficiently and correctly.

To get the most out of your PowerHub 1800, carefully read and follow the instructions in this guide. Pay special attention to the **Important Safety Instructions** and to the **CAUTION** and **WARNING** statements found throughout this manual and on the product. Please retain all packaging.

Should you have any questions before, during, or after the installation, please contact Customer Support for Xantrex branded products. Please see “Contact Information” on page ii of this Guide.

Principles of Inverter Operation

The PowerHub 1800 converts power from the batteries in two stages. The first stage is a DC-to-DC converter, used to raise the low voltage DC input to high voltage DC. The second stage is the actual inverter stage, taking the high voltage DC and converting it to a modified sine wave AC output.

The DC-to-DC converter stage uses modern high frequency power conversion technology that eliminates the bulky, low frequency (50/60 Hz) based transformers found in inverters using older technology. The inverter stage uses advanced power semiconductors that provide excellent overload capabilities.

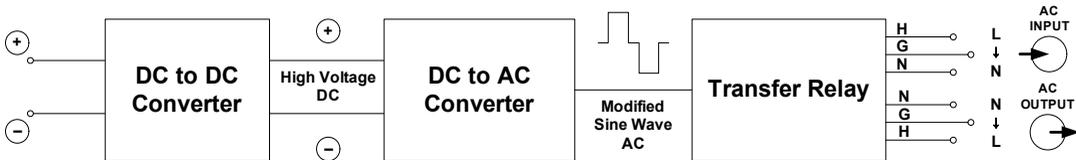


Figure 1-1 Principles of Inverter Operation

Output Waveform The AC output waveform of the PowerHub 1800 is a “modified sine wave”.

Basic Functions of the PowerHub 1800

Bypass Function When AC power is available from a generator or utility grid, the PowerHub will function as an automatic backup power unit. It will sit in Bypass mode and will pass the power through to support the loads and/or the battery charger. When the AC input fails, the PowerHub's Automatic Transfer Relay de-energizes and will switch the unit to Inverter Mode within 40 milliseconds.

Once AC input is restored, after a 20-second delay the relay energizes and qualifies the AC input and the load is automatically reconnected to the primary AC source.

WARNING

ELECTRIC SHOCK HAZARD

If any AC power is available to the PowerHub 1800, the unit will pass through that power to any loads connected to it whether the unit is turned ON or OFF. Power will be available at the four outlets on the front of the unit as well as at any outlets hardwired to the unit through the AC distribution panel. There is a blue LED above the 15 A supplemental protector on the front of the inverter panel that will illuminate if AC power is available at the AC outlets.

To completely disable this feature, the PowerHub must be completely disconnected from all input sources. Turning off the display will not eliminate this risk.

Failure to follow these instructions can result in death or serious injury.

Inverter Function When no AC power is available from a generator or utility grid, the inverter draws power from the battery bank and delivers a modified-sine wave AC output voltage. This output voltage can be accessed by using the four outlets on the front of the unit or by hardwiring the unit to the AC Distribution Panel which provides AC power to AC outlets at the site.

Charger Function The PowerHub 1800 uses any single source of AC power such as a generator or utility grid to keep the batteries charged and ready for use. The PowerHub 1800 can also use renewable energy sources to keep the batteries charged.

Important: Additional hardware, such as charge controllers, may be required for installations using renewable energy sources. Installations using renewable energy input must be hardwired into the installation for code-compliance.

Operational Voltage Range As long as the battery voltage is between 11.0 Vdc to 15.0 Vdc, the inverter will continue to deliver AC power to the loads connected to it. When the battery voltage falls below 11.0 Vdc or rises above 15.0 Vdc, the PowerHub 1800 High or Low Battery Protection will engage and shut the inverter off, stopping all output voltage to the loads.

Inverter Features

User Features

The inverter consists of the following user features.

- The Inverter Control Panel provides a user interface for monitoring power levels, battery levels, and controlling the inverter functions and displays.
- Four 120 Vac outlets on the front panel provide up to 1440 W (continuous) output power.
- One 15 A supplemental protector provides over-load protection to the four AC outlets on the front panel.
- One AC Indicator LED. This LED will illuminate whenever AC power is available, whether the unit is ON or OFF. See page 2–3 for additional information about this LED.
- One PVGFP, ground fault protection fuse for safety when using solar and wind renewable energy inputs.

| |
|---|
| ⚠ WARNING |
| ELECTRIC SHOCK HAZARD |
| The 15 A circuit breaker on the front panel is only connected to the four outlets on the front of the panel and only disconnects power to these outlets when activated. It does not disable output through the output terminals used for hardwiring. Therefore, power can still be available to loads connected through a hardwired installation. |
| Failure to follow these instructions can result in death or serious injury. |

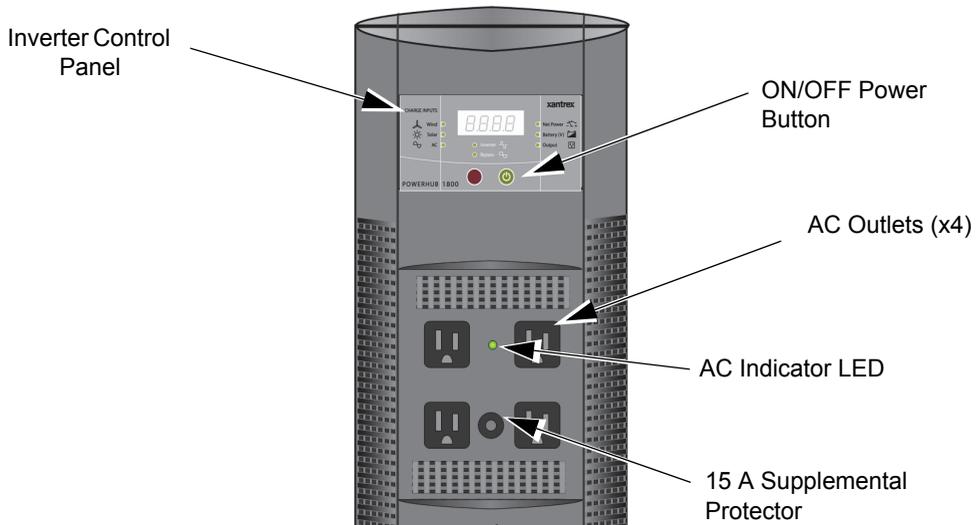


Figure 1-2 PowerHub 1800 Features

Battery Charger Features

| | |
|-------------------|---|
| Charging Settings | <p>The Battery Charger in the PowerHub 1800 has three pre-set charging profiles.</p> <ul style="list-style-type: none"> • 40 A Profile. With the 40-amp Charging Profile, the maximum bypass power for AC output to loads is approximately 600 W (4 A) with a 15 A input breaker. Use this mode to minimize battery charging time. • 10 A Profile (Default Setting). With the 10-amp Charging Profile, the maximum bypass power for AC output to loads is approximately 1400 W (12 A) with a 15 A input breaker. Use this mode when other DC charging sources are available, or if there is a high demand on AC output with battery charging a low priority. • 0 A Profile. When Charger Setting 0 A is selected, the Battery Charger is disabled and will not charge the batteries. Use this mode if other DC charging sources are available or if it is necessary to temporarily disconnect the AC charging system. <p>See “Battery Charger Specifications” on page A-3 for details on the specific profile parameters.</p> |
| Charging Process | <p>The Battery Charger uses a three-stage charging process to maintain the battery (or batteries) in operational condition. This process is illustrated in Figure 1-3, “Three-Stage Charging Process” on page 1-6.</p> |
| Bulk Stage | <p>The bulk stage will start upon connection of AC and with the unit turned on. The constant current mode is limited to 40 A or 10 A depending on setting. The voltage setpoint for this stage is 14.2 Vdc. The Charger will transition to the Absorption Stage upon reaching the bulk voltage setpoint.</p> |
| Absorption Stage | <p>In the Absorption Stage, the constant voltage mode is limited to 14.2 Vdc. The current will drop as the batteries charge. Upon dropping to 4 A, the unit will transition to the Float charge. This stage will not exceed 4 hours maximum.</p> |
| Float Stage | <p>In the Float stage, the constant voltage mode limited to 13.7 Vdc. An 8-hour timer is started at this point.</p> <p>If, during the 8-hour timer, the current rises to 6 A, the unit transitions back to the Bulk Stage and starts over.</p> <p>If the unit stays at 4A or less for the entire 8 hour timer, it will transition to Standby Mode.</p> |

Standby Mode

In the Standby Mode, the Charger is OFF but monitors the battery voltage. If battery voltage drops below 12.5 Vdc, the unit will start a new Bulk stage.

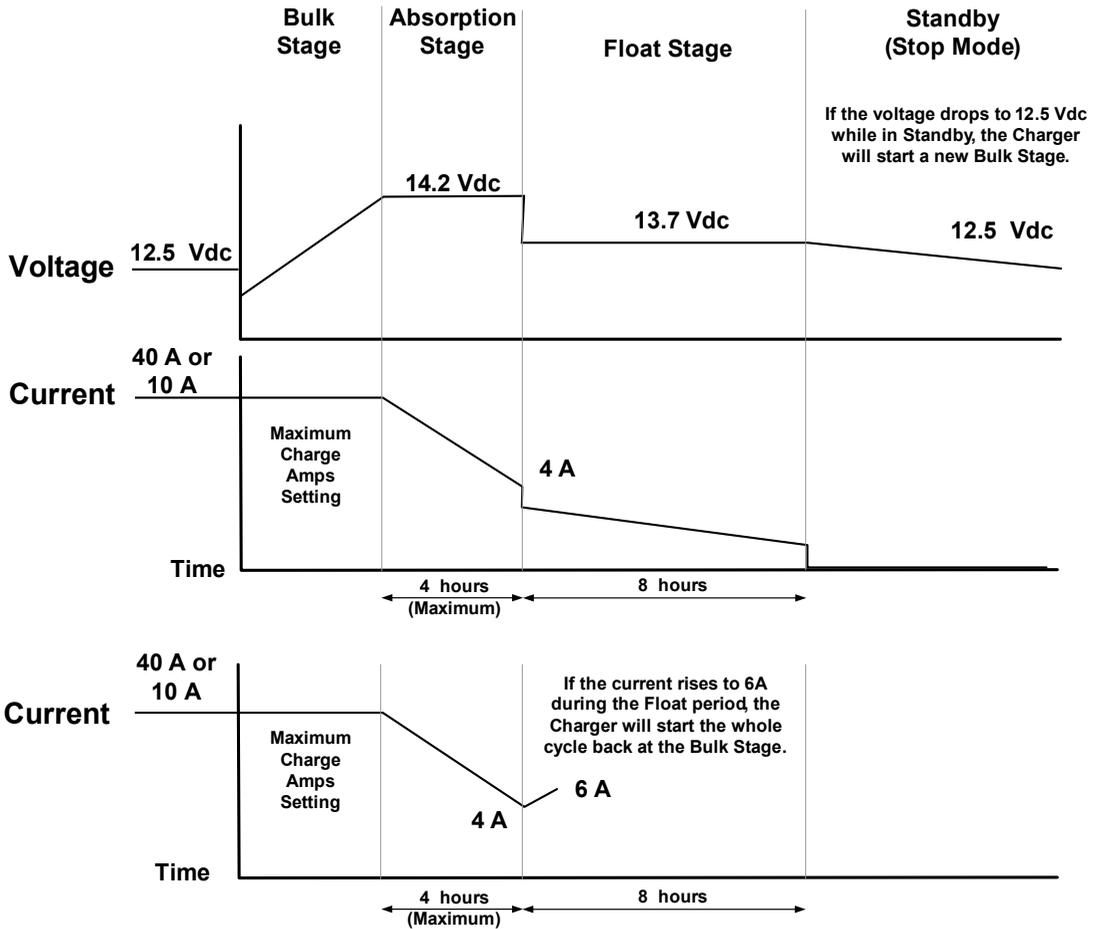


Figure 1-3 Three-Stage Charging Process

The PowerHub 1800 will reset to the default setting of 10 A whenever one of the following occurs.

1. The unit is turned OFF by the ON/OFF Button.
2. All DC input sources (solar panels or wind generators) are removed and utility AC is not available.

2

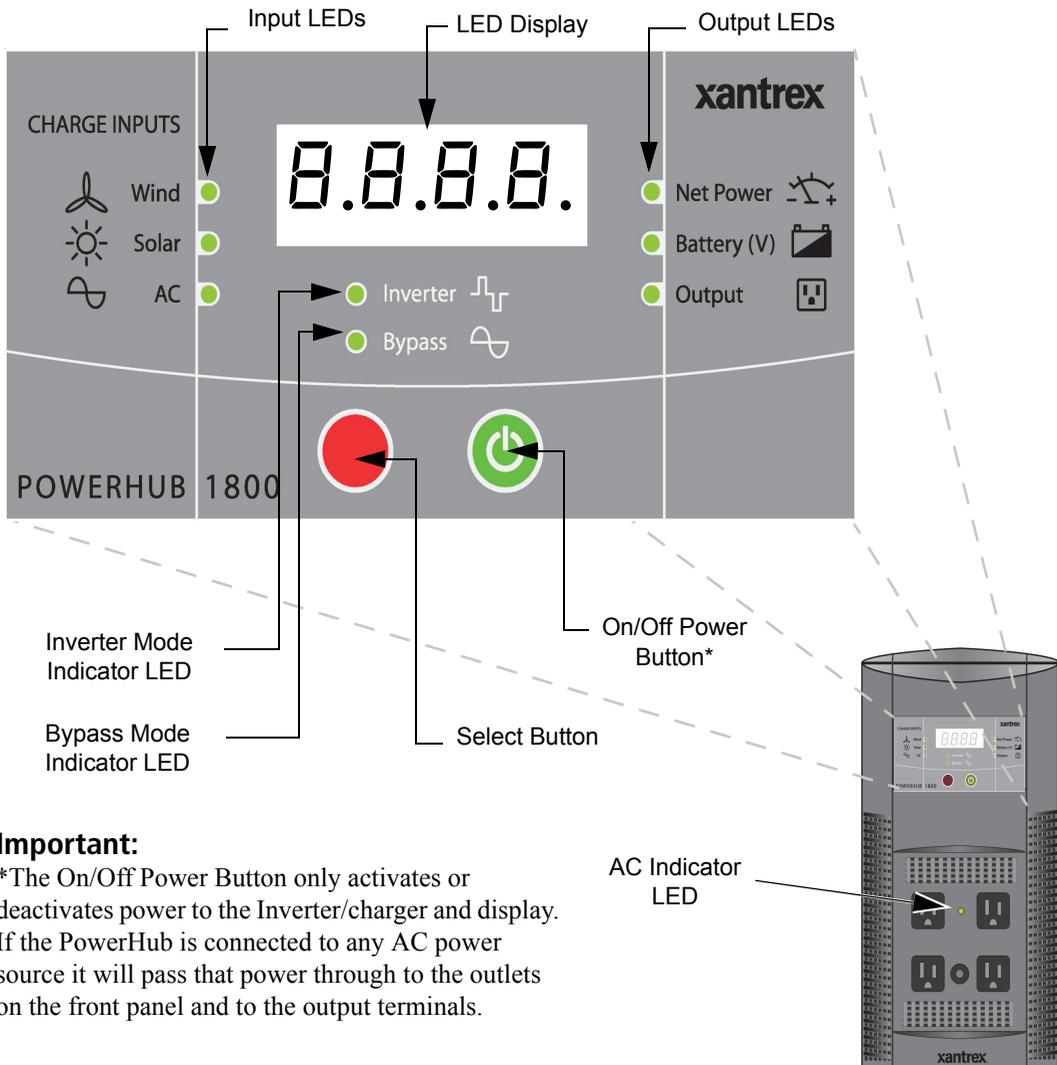
Operation

Chapter 2 contains information on operating the PowerHub 1800.

| For this topic... | See... |
|---|---------------|
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Inverter Control Panel

The Inverter Control Panel has nine LEDs; six Status LEDs (three for input/charge levels and three for output power levels), two Mode Indication LEDs, one AC Indicator LED. Two push buttons provide ON/OFF control and Display Select features. An LED Display communicates input and output power levels, battery voltage, and error codes.



Important:

*The On/Off Power Button only activates or deactivates power to the Inverter/charger and display. If the PowerHub is connected to any AC power source it will pass that power through to the outlets on the front panel and to the output terminals.

Figure 2-1 The PowerHub 1800 Inverter Control Panel

User Controls and Display

The following provides a detailed description of the user controls and LED display function. For operating instructions, see “Basic Operation” on page 2–6.

On/Off Power Button (Green) To turn the power ON or OFF, press and hold the green ON/OFF Power Button for approximately 1 second.

Important: The ON/OFF Button controls the output of the inverter/charger and the displays only. It does not control or turn off the AC output in Bypass Mode. Therefore, if any power is available to the unit, the unit will function in Bypass Mode and power will be available at all outlets or output terminals even if the PowerHub is turned OFF. The blue AC Indicator LED between the top two AC outlets on the front panel will illuminate if AC power is available at any of the outlets.

LED Display The LED Display consists of a 4-digit numerical display (e.g., *B.B.B.B.*). (Note: 1.0 kW = 1000 watts)

- Negative numbers (e.g., -1.00) represent Output Power in kilowatts (kW). This number represents the power being removed from the batteries to power the loads. This can only occur when displaying Net Power using the Select button while in Inverter Mode.
- Positive numbers (e.g., 0.56) represent Input Power in kilowatts. This number represents the power being used to charge the batteries and power the loads.
- Battery Level information is displayed in volts DC. The Battery Level LED will illuminate when this value is being displayed. (e.g., 12.8)
- AC charger information is displayed in kilowatts. This value indicates the amount of power available to charge the batteries. The AC LED will illuminate when this value is being displayed. This value indicates the amount of power being used to charge the batteries.

The Display by default will display the Net Power value.

Fault Condition Display If a fault occurs, the error code will immediately be displayed as a flashing, 3-digit alpha/numeric code (e.g., *EEI*). An audible beep will sound to draw attention to the fault condition.

For a complete list of Error Codes, see Chapter 3, “How to Troubleshoot the PowerHub 1800”.

AC Indicator LED The AC Indicator LED indicates that AC power is available at all outputs. If AC power is available, this LED will illuminate whether or not the PowerHub 1800 inverter is turned on.

Operating Mode LEDs

Bypass LED When AC power source is available, the PowerHub 1800 will pass the power through to the loads and will also keep the battery bank charged and usable. The Bypass LED will illuminate when the unit is in this mode.

Important: The ON/OFF Button controls the output of the *inverter only*. It does not control or turn off the AC output in Bypass Mode. Therefore, if any power is available to the unit, the unit will function in Bypass Mode and power will be available at all outlet or output terminals even if the PowerHub is turned OFF. The blue AC Indicator LED between the top two AC outlets on the front panel will illuminate if power is available at the front four outlets.

On initial power up or if transferring from Inverter Mode back to Bypass Mode, the PowerHub takes approximately 20 seconds to identify if an AC source is available and stable. If the AC source is within the acceptable voltage range, the PowerHub will automatically enter Bypass Mode. During this time, the Bypass Mode LED will flash and power will still be provided by the inverter. When the AC source has been qualified, the Bypass Mode LED will stop flashing and illuminates solid and the loads will be powered by the AC source.

Inverter LED If the PowerHub is on with AC present and the AC source fails, the PowerHub 1800 automatically switches to Inverter Mode within 40 milliseconds. When in Inverter mode, the inverter is using the power stored in the battery bank to provide power to the loads and the Inverter LED will illuminate.

Status LEDs

Input LEDs

Select Button (Red) Pressing the red Select Button cycles the output on the display through the available Input/Output power levels.

If the Select button is not pushed within 10 seconds, the display will automatically return to the Net Power value.

Wind LED When the Select Button is pressed until the Wind LED is illuminated, the Wind Input wattage levels are displayed in kilowatts. These values are the inputs on the 80 A DC input terminals.

Solar LED When the Select Button is pressed again within 10 seconds and the Solar LED is illuminated, the Solar Input wattage levels are displayed in kilowatts. These values are the inputs on the 32 A DC input terminals.

AC LED If the unit is in Bypass Mode, when the Select Button is pressed again within 10 seconds and the AC LED is illuminated, the battery charger power level is displayed in kilowatts.

Output LEDs

Net Power LED By default the Net Power LED represents the difference between the input and the output power levels. This value is shown on startup and will return to this display if the Select button is not pressed for 10 seconds.

When using the Select Button to cycle through the displays and the Net Power LED is illuminated, the power level displayed will depend on whether the unit is in Bypass Mode or Inverter Mode.

In Bypass Mode, the value displayed represents the power, in kilowatts, that is available to charge the battery and to power the loads. This will be a positive number.

In Inverter Mode, this value displayed represents the total amount of power in kilowatts that is being drawn from the battery bank (negative numbers) or is available to charge the battery by the DC source while the inverter is running (positive numbers).

Battery LED When the Select Button is pressed again within 10 seconds and the Battery Level LED is illuminated, the battery voltage level is displayed in DC volts. It will also show “FUL” when the battery is charged through the AC charger and reaches float and standby mode.

Output LED When the Select Button is pressed again within 10 seconds and the Inverter LED is illuminated, the Inverter Output power is displayed in kilowatts. This only displays if the unit is in Invert Mode.

Selecting Charger Settings

Charger Settings Pressing and holding the Select Button for 3-5 seconds will change the display to show the AC charger current setting and the AC LED will flash.

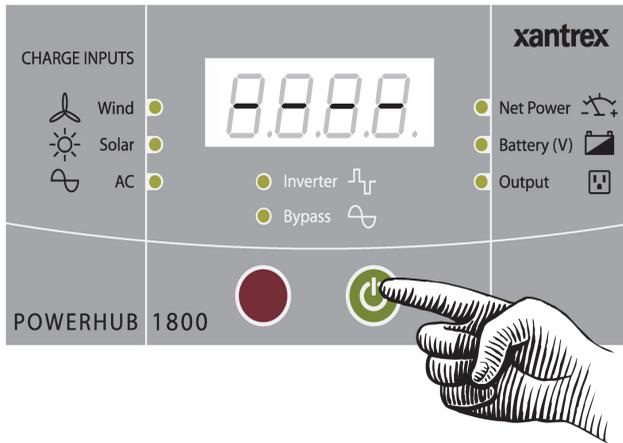
See “Battery Charger Features” on page 1–5 for more information regarding setting parameters. See “Changing Charging Settings” on page 2–9 for instructions on changing this setting.

Basic Operation

The following figures show what the Inverter Control Panel will look like when the user controls are used.

Important: The values shown in the displays of the following illustrations are examples only. Actual values may vary based on what is connected to the unit.

Power On and Off

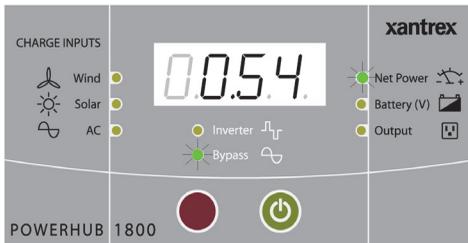


To turn the power to the PowerHub ON or OFF:

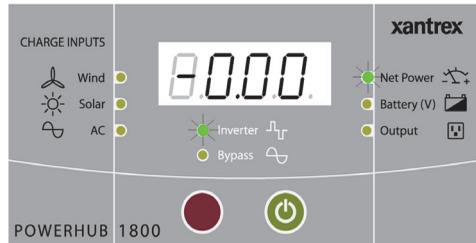
- ◆ Press and hold the green ON/OFF Power Button for approximately 1 second.

If any input power is available, the Inverter Control panel will display as shown below. The value shown on the display defaults to indicate Net Power.
 $\text{Net Power} = \text{Input} - \text{Output}$

If no input power is available and no loads are connected to the unit, the Inverter Control panel will display as shown below.



Default Screen Example
Example indicates 540 watts.



Default Screen Example

Figure 2-2 Basic Startup Screens

Changing the Display

Press the red Select button to cycle the display through the input and output power values.

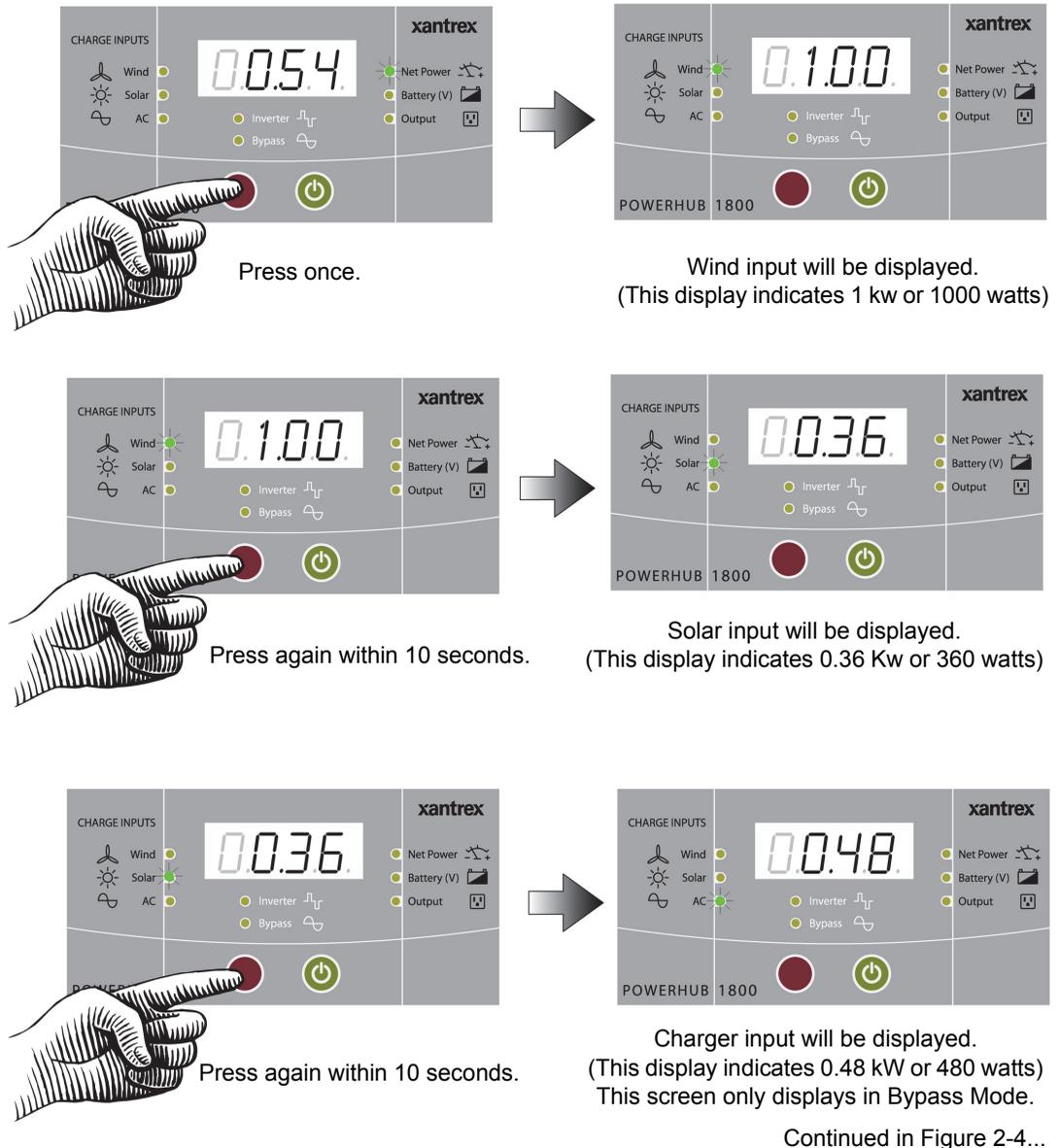


Figure 2-3 Input Displays

Continued from Figure 2-3...

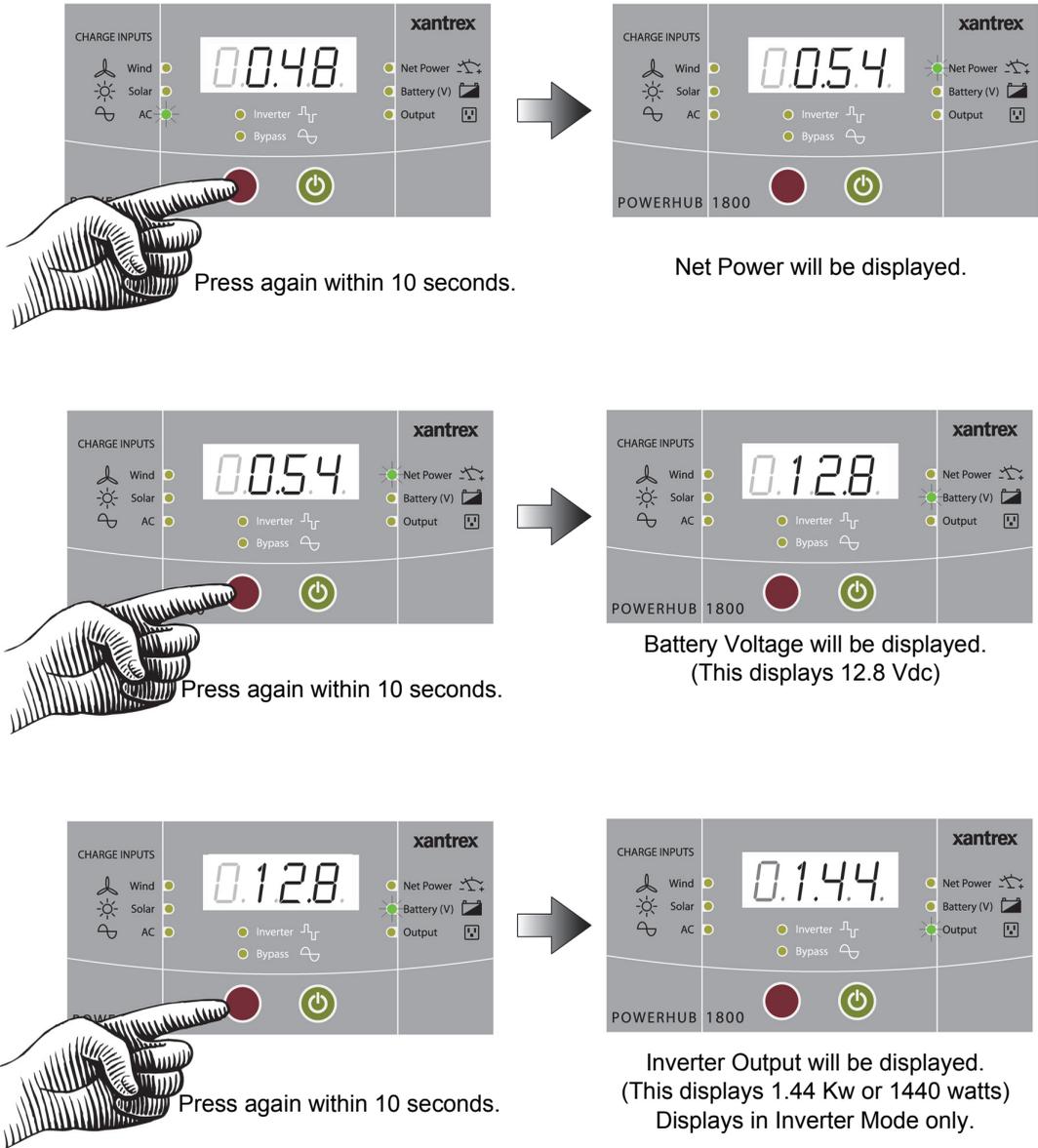


Figure 2-4 Output Displays

Changing Charging Settings

Default Setting

The PowerHub 1800 is set at the factory to default to the 10 A Charging Profile. In the event that one of the other profiles are required, follow the instructions below to change the setting.

Setting the Selection

To set the selection to the desired profile, stop pressing the Select Button when the desired profile is displayed. The unit will set the profile shown in the display, then will return to the default screen within 10 seconds.

Returns to Default

The charging setting will revert to the 10 A default setting whenever the ON/OFF Button is pressed or all DC input sources are removed and utility AC is not available.

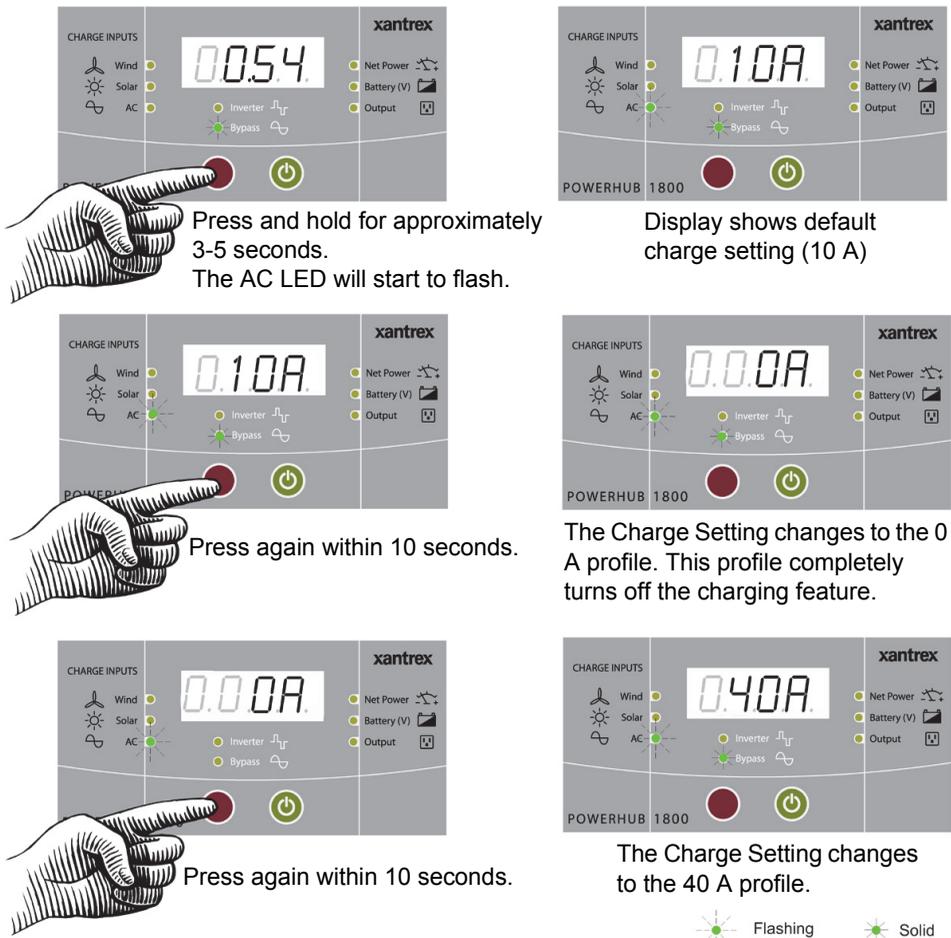


Figure 2-5 Input Displays

If the AC Charger goes into an over temperature shutdown condition, the 40 A setting will automatically change to 10 A to reduce the charging current. The charging current will change back to 40 A when the unit cools to an acceptable temperature.

Important:

When Charger is set to 40 A or 10 A, Battery Level will flash between battery voltage and 'FUL' when it reaches Float Mode or Off Mode. Otherwise it shows measured battery voltage.

When AC Charger is set to 0 A, Battery Level shows measured battery voltage.

Connecting AC Loads

| |
|--|
| NOTICE |
| EQUIPMENT DAMAGE Never insert the AC input cord into the AC outlets on the front of the PowerHub 1800 when the batteries are connected. This can damage the unit and will void the warranty. Failure to follow these instructions can damage the inverter. |

Continuous AC loads of 1440 watts (12 A) can be connected and run from the PowerHub 1800 through the four AC outlets on the front panel.

Important: Know your loads. Use the formula below to help determine the watts of the load if only amp ratings are provided with the appliance.

$$\text{Volts} \times \text{Amps} = \text{Watts}$$

Maximum watts available for continuous use on the PowerHub 1800 = 1440 W

Maximum amperage available for AC loads is 12 A.

$$120 \text{ V} \times 12 \text{ A} = 1440 \text{ W}$$

In case of an
Overload
Shutdown....

Exceeding 1800 watts will cause the unit to display an overload error code and the unit will shut down.

In the event of an overload shutdown, remove the loads that are connected to the PowerHub and turn the power OFF, then back ON.

If the unit is hardwired to a sub-panel, it will also be necessary to check the circuit breaker in the sub-panel.

In the event of an overload shutdown, if charge settings had been changed to 40 A or 0 A prior to the shutdown, the charging parameters will have to be reset. Otherwise, the unit will default back to the 10 A profile.

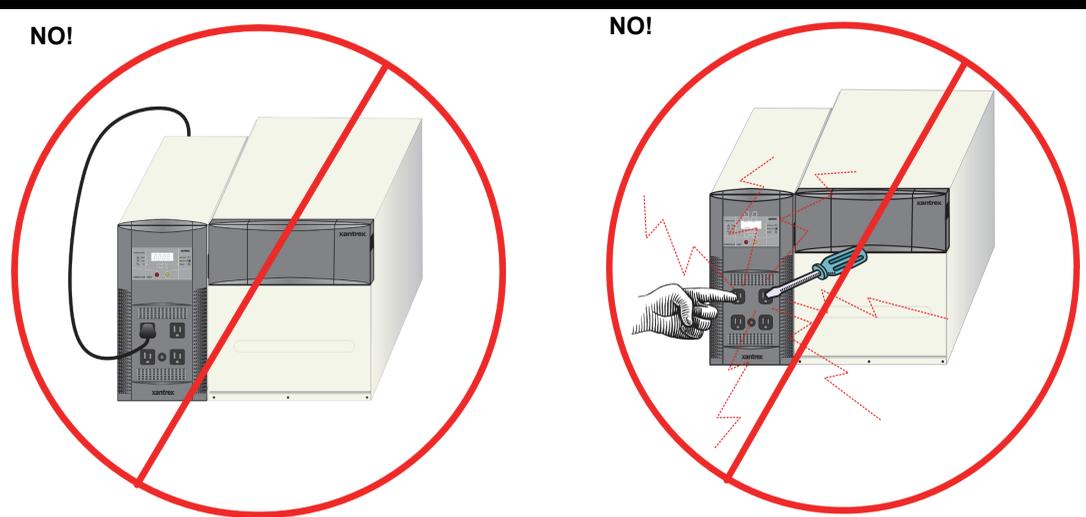
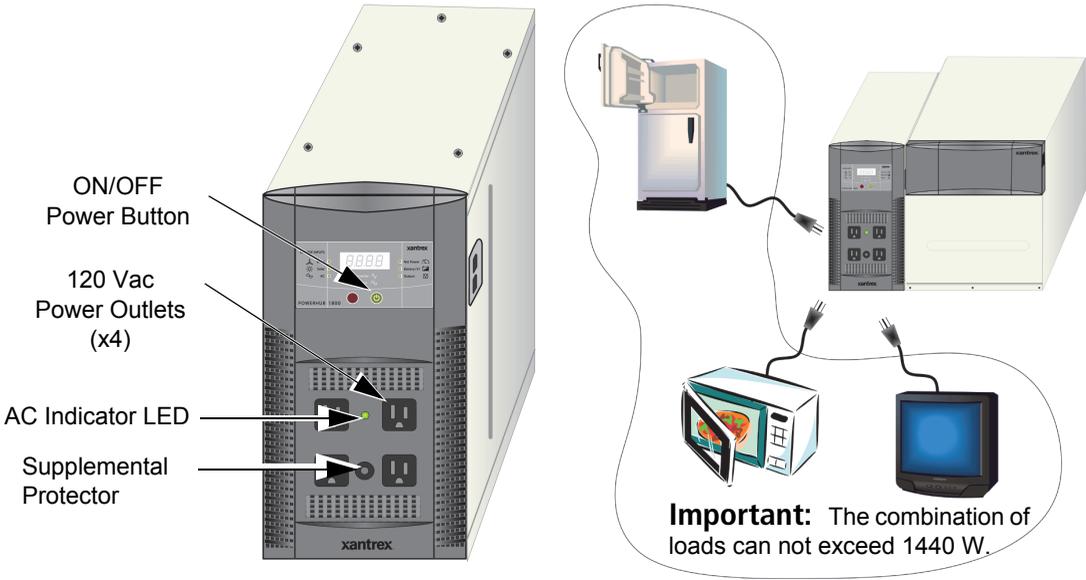


Figure 2-6 Connecting AC Loads

⚠WARNING

ELECTRIC SHOCK HAZARD

Do not insert objects *not intended for use with an electric appliance* into the AC power outlets on the PowerHub (e.g., fingers, tools, jewelry). Not intended for use by small children.

Failure to follow these instructions can result in death or serious injury.

Typical Loads that might be used with the PowerHub 1800

The following types of appliances can be used with the PowerHub 1800 providing.

- Sump pumps
- Microwaves
- Refrigerators
- Freezers
- Lighting
- Television or Audio Equipment
- Most power tools

Loads That Might Not Work Well With the PowerHub 1800

The following types of appliances might not work as expected with the PowerHub 1800. See “Possible Problem Loads” on page 3–8 for additional information.

- Some pellet stoves that have an auger for pellet feeding
- Some electronic furnace controls
- Some rechargeable devices
- Variable speed fans or lights with dimmer switches

Loads that should NOT be used with the PowerHub 1800

The PowerHub 1800 is not intended for use in connection with life support systems or other medical equipment or devices.



Figure 2-7 Loads That Should Never Be Used With the PowerHub 1800

3

Troubleshooting

Chapter 3 explains how to troubleshoot the PowerHub 1800 and describes the error codes that may be displayed on the LCD.

| For this topic... | See... |
|---|---------------|
| “How to Troubleshoot the PowerHub 1800” | page 3-2 |
| “Error Codes” | page 3-3 |
| “If Utility Power is NOT Available” | page 3-5 |
| “If Utility Power is Available” | page 3-7 |
| “Possible Problem Loads” | page 3-8 |

How to Troubleshoot the PowerHub 1800

Important: If the unit is not performing as expected, BEFORE returning the unit to the retailer, please review this information carefully.

The following information is provided to assist in the troubleshooting of the PowerHub 1800. Please review this information carefully.

Check First....

Check the following tables for information specific to your unit.

Table 3-1 provides information on the Error Codes that may be seen on the Display. Table 3-2 describes possible issues that may arise when utility power is NOT available. Table 3-3 describes possible issues that may arise when utility power is available.

Check Next....

Visit www.xantrex.com/support.asp and check the FAQs (Frequently Asked Questions) for your product. Many additional questions are addressed at this website.

Finally....

If the FAQs don't address the problem you're experiencing, then see "Warranty" on page WA-1 for contact information for Xantrex Customer Service. Contact a Xantrex Customer Support representative for assistance.

Error Codes

The following error codes may be displayed on the LED display if the described fault conditions occur.

Table 3-1 Error Codes for Troubleshooting the PowerHub 1800

| Error Code Displayed | Description of Error | Description of Condition | Resolution |
|-----------------------------|----------------------------------|---|---|
| <i>E01</i> | DC Input Under Voltage Shutdown | <p>Unit shuts down.</p> <p>The input voltage has dropped to below the operation voltage limit of 11.0 to 10.5 V.</p> <p>An alarm continues to beep once every second until input/output voltage drops to 10.3 V.</p> <p>The alarm will continue to beep once every 30 seconds until battery voltage reaches 10.0 V. If the battery reaches 10.0 V, the display turns OFF and the unit powers down completely.</p> | <p>The unit will automatically reset once the fault condition is removed.</p> <p>If this condition is not corrected and the unit powers down completely, it will be necessary to press the ON/OFF Button to turn the unit ON again.</p> |
| <i>E02</i> | DC Input Over Voltage Shutdown | <p>Unit shuts down.</p> <p>An input voltage is greater than 15 V.</p> <p>The alarm will continue to beep once every second.</p> | <p>The unit will automatically reset once the fault condition is removed.</p> |
| <i>E03</i> | AC Output Overload Shutdown | <p>Unit shuts down.</p> <p>An AC load applied to the system in inverter mode is above operation limit.</p> | <p>Remove excess AC loads.</p> <p>Reset of unit is required.</p> <p>To reset the unit, turn it OFF and back ON.</p> |
| <i>E04</i> | System Over Temperature Shutdown | <p>Unit shuts down.</p> <p>System internal temperature is above operation limit.</p> <p>The alarm will continue to beep once every second.</p> | <p>Reduce loads or reduce ambient temperature around the PowerHub.</p> <p>The unit will automatically reset once the unit cools down and reaches a safe operating temperature.</p> |
| <i>E05</i> | DC Input Under Voltage Alarm | <p>System is still operating but input voltage has dropped too close to the shutdown limit (11.0 to 10.5 Vdc).</p> <p>Alarm will beep once every two seconds until the warning condition is removed.</p> | <p>Unit continues to run.</p> <p>If the warning is ignored, the unit will eventually go to the <i>E01</i> fault condition.</p> |

Table 3-1 Error Codes for Troubleshooting the PowerHub 1800

| Error Code Displayed | Description of Error | Description of Condition | Resolution |
|-----------------------------|---------------------------------|--|---|
| <i>E06</i> | AC Output Overload Warning | System is still operating but AC load applied to the system in inverter mode is close to shutdown limit. Alarm will beep once every two seconds until the warning condition is removed. | Unit continues to run. If the warning is ignored, the unit will eventually go to the <i>E03</i> fault condition. |
| <i>E07</i> | System Over Temperature Warning | System is still operating but system internal temperature is close to shutdown limit. Alarm will beep once every two seconds until the warning condition is removed. | Unit continues to run. If the warning is ignored, unit will eventually go to the <i>E04</i> fault condition. |
| <i>E09</i> | Ground Fault Fuse Open Warning | Unit shuts down. A ground fault has been detection. | Turn the unit off. Check all DC Input connections (PV, wind etc.) and repair any faults or damage. Replace the ground fault fuse (see page 3–10) and restart the unit |

If Utility Power is NOT Available

The following fault conditions may arise when utility power is not available.

Table 3-2 Possible Problems if Utility Power is Not Available

| Problem | Probable Cause | Solution |
|---|--|--|
| Low output voltage. (96 Vac to 104 Vac) | Voltmeter used cannot accurately read the RMS voltage of a modified sine wave. | Use a true RMS voltmeter. |
| Display is OFF, AC is not available on both hardwired and units AC sockets. | The unit is OFF. The inverter has no output. The unit might have been connected with reverse DC input polarity. | Turn the unit ON. <ul style="list-style-type: none"> •Check battery box connection. •Check battery box fuses. •Check wind or solar connections. <ul style="list-style-type: none"> •Check battery box fuses (all 10 of them) and check battery polarity. •Correct the cabling if connected improperly. •Replace the fuses in the battery box. <p>If the unit still does not start, it may be damaged. Damage caused by reverse polarity is not covered by the warranty.</p> |
| AC is available but alarm beeps. | Low Voltage Warning (error code <i>EE5</i>) Over Load Warning (error code <i>EE6</i>) Over Temperature Warning (error code <i>EE7</i>) | Charge battery immediately or unit will be under voltage shutdown shortly. Load applied to unit is close to overload shutdown, reduce the load immediately or overload or over temp may occur shortly. Check unit ventilation and reduce the load applied to the unit or unit will run into over temperature shutdown shortly. |
| Display is ON, AC is available on hardwire but not on unit AC socket | 15 A supplementary protector has tripped. | Press reset button on the front panel to reset the protector. |

Table 3-2 Possible Problems if Utility Power is Not Available

| Problem | Probable Cause | Solution |
|---|---|--|
| <p>Display is ON, AC is not available on both hardwired and unit AC socket.</p> | <p>Low input voltage (error code <i>E01</i>)</p> | <p>Recharge the battery; check the connections and cable.</p> |
| | <p>High input voltage (error code <i>E02</i>)</p> | <p>Make sure the unit is connected to a 12 V battery. Check battery is not overcharged.</p> |
| | <p>Unit is overload protected (error code <i>E03</i>)</p> | <p>Reduce the amount of loads connected to the unit or the start up surge on the load exceed surge limit of the unit.</p> |
| | <p>Unit is thermal protected (error code <i>E04</i>)</p> | <p>Allow the unit to cool off. Reduce the load if continuous operation is required.</p> <p>Improve ventilation. Make sure the inverter's ventilation openings are not obstructed.</p> <p>Reduce the ambient temperature.</p> |
| | <p>Unit is ground fault protected (error code <i>E05</i>)</p> | <p>Turn the unit off. Check all DC Input connections (PV, wind etc.) and repair any faults or damage. Replace the ground fault fuse (see page 3–10) and restart the unit</p> |
| <p>Digital display or LED is flickering especially in a dark environment.</p> | <p>Display is normal</p> | <p>N/A</p> |
| <p>Inadequate run time.</p> | <p>Internal battery is not fully charged.</p> | <p>Charge the internal battery by leaving the charger backup power system plugged into a wall outlet at least 20 hours.</p> |
| | <p>Internal battery has aged past its warranted shelf life, the available run time decreases.</p> | <p>Replace the internal battery. The internal battery also ages prematurely if the system is installed in a hot environment.</p> |
| <p>Products connected to unit malfunction or overheat.</p> | <p>Products connected to backup power system do not accept modified sine wave form.</p> | <p>Your application is not compatible with backup power system modified sine wave output.</p> <p>See “Rechargeable Devices” on page 3–9.</p> |

If Utility Power is Available

The following fault conditions may arise when utility power is available.

Table 3-3 Possible Problems if Utility Power is Available

| Problem | Probable Cause | Solution |
|---|--|--|
| Display is OFF, AC is available on both hardwire and unit AC socket | Inverter is turned OFF. | AC output is always available when AC input is available. Under this condition, the inverter will not back up the power when utility power is OFF. |
| Display is OFF, AC is not available on both hardwire and unit AC socket | Main AC Panel or AC generator input is beyond the operating range of the unit (103 to 132 Vac). | Check utility or generator output voltage. |
| Display is ON, AC is not available on both hardwire and unit AC socket | The 15A input circuit breaker on the Main AC Panel or AC generator is tripped or turned OFF. The 15 A circuit breaker on AC Distribution Panel and 15 A supplementary protector near the four AC outlets on the front panel have tripped. | Reset the 15 A input circuit breaker. Reset the 15A supplemental protector near the four AC outlets on the front panel and reset the 15A circuit breaker on the AC Distribution Panel |
| Display is ON, AC is available on hardwire output but not on unit AC socket | 15 A supplementary protector on the front panel has tripped. | Press the reset button to reset the circuit breaker. |
| Bypass LED is flashing | During the first 20 seconds of transfer from inverter to Bypass Mode, the inverter continues to run and the Bypass LED flashes. This provides time for the utility to get steady before it switches over. During the 20 seconds delay time, the display feature is frozen. | None. |

Possible Problem Loads

The inverter can drive most loads, however, there are special conditions that can cause a load to behave differently than expected. The following describes some of the common problems encountered when using an inverter.

⚠️ WARNING

FIRE HAZARD

Transformerless Battery Chargers are not to be used with any model of the PowerHub 1800 family. Connecting a transformerless battery charger could result in an overheating condition and possibly a fire.

Failure to follow these instructions can result in death or serious injury.

- Ceiling Fans** Most large diameter, slow turning fans run correctly, but generate more noise than when connected to utility power. High speed fans tend to operate normally.
- Cell Phones** Some cellular telephones experience interference in the form of a clicking sound.
- Clocks** The inverter keeps the frequency accurate to within a few seconds a day; however, external loads in the system may alter the inverter’s output waveform causing clocks to run at different speeds. There may be periods where clocks keep time and then mysteriously do not.
- Dimmer Switches** Most dimmer switches lose their ability to dim the lights when used with an inverter and operate only in the fully ON or OFF position. Newer, microprocessor controlled dimmers tend to work better in inverter applications.
- Heavy Loads** If the battery bank cannot deliver the necessary amperage to drive a heavy load, the inverter will shut OFF. The battery voltage will then slowly rise back above the low voltage threshold causing the inverter to resume operation. As soon as the heavy load draws the batteries down, the cycle will continue unless the load is reduced or an additional source of power is added.
- Microwave Ovens** Microwave ovens are sensitive to peak output voltages. The higher the voltage, the faster they cook. Since the inverter’s peak output voltage is dependent upon battery voltage and load size, the microwave’s cook time may need to be increased.
- Printers** Most inkjet type printers work well in inverter applications. Laser printers, however, require high current for their fusing circuit and are not recommended for use with an inverter.

Rechargeable Devices

| |
|----------------------|
| <i>NOTICE</i> |
|----------------------|

| |
|-------------------------|
| EQUIPMENT DAMAGE |
|-------------------------|

| |
|---|
| <p>This equipment produces a modified sine wave output. Equipment damage may occur if the rechargeable appliance is not designed to use modified sine wave output. If you are unsure about using your rechargeable appliance with the modified sine wave, contact the equipment manufacturer.</p> |
|---|

| |
|--|
| <p>Failure to follow these instructions can damage connected equipment.</p> |
|--|

When first using a rechargeable device, monitor its temperature for 10 minutes to ensure it does not become abnormally hot. Excessive heat will indicate that it is incompatible with the inverter.

Most rechargeable battery-operated equipment uses a separate charger or transformer that is plugged into an AC receptacle and produces a low voltage charging output.

Some chargers for small rechargeable batteries can be damaged if connected to the PowerHub. Do not use the following with the PowerHub:

- Small battery-operated appliances like flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.
- Some chargers for battery packs used in power hand tools. These affected chargers display a warning label stating that dangerous voltages are present at the battery terminals.

Ground Fault Protection

⚠️⚠️ DANGER

ELECTRICAL SHOCK AND FIRE HAZARDS

- All wiring should be done by qualified personnel to ensure compliance with all applicable installation codes and regulations.
- Disconnect all AC and DC power sources.

Failure to follow these instructions will result in death or serious injury.

Ground fault protection is required when using either solar or wind renewable energy input. Figure 3-1 shows the location of the ground fault protection terminals and replaceable fuse.

When a grounding fault is detected, the ground fault protection fuse will blow. The system must be shut down completely, the fault corrected, the fuse replaced (see “Replacing the Ground Fault Protection Fuse”) and then the system restarted.

Replacing the Ground Fault Protection Fuse

⚠️ WARNING

ELECTRICAL SHOCK AND FIRE HAZARDS

- Replace the ground fault protection fuse only with the same type and ratings of fuse.
- After disconnection both AC and DC power for the system, wait five minutes before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Internal capacitors remain charged for five minutes after disconnecting all sources of power.

Failure to follow these instructions can result in death or serious injury.

The ground fault protection fuse will blow when severe leakage occurs between the PV array and earth ground, or when the system has been installed with faulty DC wiring. Before replacing the fuse, it is important to have qualified service personnel, such as a certified electrician or technician, to determine the cause of the ground fault.

To replace the ground fault protection fuse:

1. Remove the five Phillips screws on the top of the inverter and lift off the panel to expose the terminals, as shown in Figure 3-1.
2. Locate the PV ground fault protection fuse.

3. Using a slot blade screwdriver, carefully remove the blown fuse by pushing the fuse cap, turning it counter clockwise (a quarter turn only), and pulling out the fuse holder from the receptacle.
4. Replace the fuse with a new Littelfuse 5mm×20mm fuse rated 1A 250 Vac slow blow (or equivalent).
5. Return the fuse holder with the new fuse back into the receptacle and using a slot blade screwdriver, carefully push the fuse cap while turning it clockwise (a quarter turn only).
6. Replace the panel on the top of the inverter and tighten all five screws securely.



BEFORE REMOVING INVERTER COVER: Check to ensure the AC Indicator LED is NOT illuminated and that there are absolutely no sources of power connected to the PowerHub.

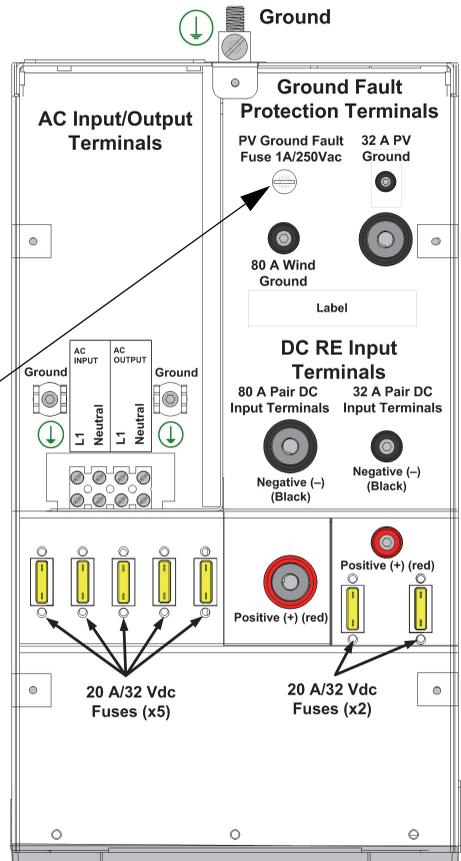
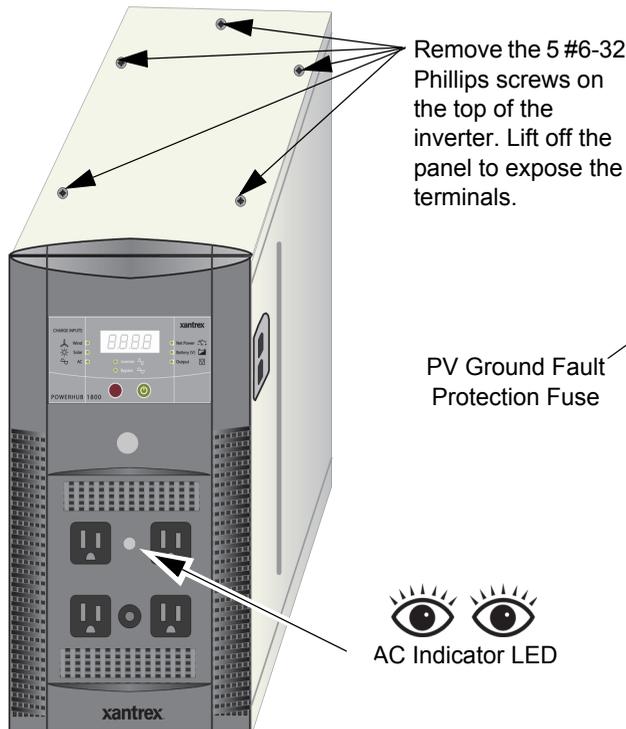


Figure 3-1 Replacing Ground Fault Protection Fuse

A

Specifications

Appendix A provides electrical and physical specifications for the PowerHub 1800.

Electrical Specifications

Table A-1 Electrical Specifications for the Inverter

| Parameter | PowerHub 1800 Inverter |
|-----------------------------------|---|
| Maximum Output Power | 1800 W (15A) (5 minutes maximum) |
| Continuous Output Power | 1440 W (12 A) |
| Surge Rating | 2880 W (24 A) |
| Input Voltage Range | 10.5 to 15.0 Vdc |
| Input Frequency Range | 60 Hz |
| Peak Efficiency | 88% |
| System Shutdown Mode (Display On) | < 12 W |
| Idle Mode | <1.5 W |
| Output Frequency | 60 Hz / ±1 Hz |
| Output Waveform (resistive load) | Modified sine wave (>30% THD) |
| Output Voltage (at no load) | 110 to 125 Vac |
| Low Battery Cutout | 10.5 Vdc with < 240 W load and 11.0 V with > 240 W load |
| High Battery Cutout | 15.0 Vdc |
| Transfer Relay Rating | 20 A |
| Transfer Time AC to Inverter | < 40 ms |
| AC Qualification Time | ~ 20 seconds |
| Protection | <ul style="list-style-type: none"> • Five 20 A/32 Vdc fuses protecting the 80A/1000 W DC input terminal. • Two 20 A/32 Vdc fuses protecting 32A/ 400 W DC input terminal. • One 15 Aac supplemental protector. • One 1 A/250 Vac fuse for system ground fault protection. |

Table A-2 Electrical Specifications for the Battery Box

| Parameter | Battery Box ¹ |
|------------|--|
| Protection | Ten 20 A/32 Vdc Fuses for short circuit and reverse polarity conditions. |

1. Stand-alone battery box Product Part Number: PH1800-BBX

Physical Specifications

Table A-3 Physical Specifications of the Inverter

| Parameter | PowerHub 1800 |
|------------------------|--|
| Dimensions (H x W x L) | 14.75" × 8.0" × 16.0" (37.5 cm × 20 cm × 41 cm) |
| Weight | 28.6 lb (13.0 kg) |
| Operating Temperature | 0 °C (32 °F) to 40 °C (104 °F) |
| Storage Temperature | -30 °C (-22 °F) to 70 °C (158 °F) |

Table A-4 Physical Specifications of the Battery Box

| Parameter | Battery Box ¹ |
|------------------------|--|
| Dimensions (H x W x L) | 14.0" × 13.875" × 20.5" (35.6 cm × 35.2 cm × 52.7 cm) |
| Weight | 29 lb (13.2 kg) |
| Operating Temperature | 0 °C (32 °F) to 40 °C (104 °F) |
| Storage Temperature | -30 °C (-22 °F) to 70 °C (158 °F) |

1. Stand-alone battery box Product Part Number: PH1800-BBX

Battery Charger Specifications

| | |
|------------------|---|
| Charging Process | The Battery Charger uses a three-stage charging process to maintain the battery (or batteries) in operational condition. This process is illustrated in Figure A-1, “Three-Stage Charging Process” on page A-4. |
| Bulk Stage | The bulk stage will start upon connection of AC and with the unit turned on. The constant current mode is limited to 40 A or 10 A depending on setting. The voltage setpoint for this stage is 14.2 Vdc. The Charger will transition to the Absorption Stage upon reaching the bulk voltage setpoint. |
| Absorption Stage | In the Absorption Stage, the constant voltage mode is limited to 14.2 Vdc. The current will drop as batteries voltage rises. Upon dropping to 4 A, the unit will transition to the Float charge. This stage will not exceed 4 hours maximum. |

- Float Stage** In the Float stage, the constant voltage mode limited to 13.7 Vdc. An 8-hour timer is started at this point.
 If, during the 8-hour timer, the current rises to 6 A, the unit transitions back to the Bulk Stage and starts over.
 If the unit stays at 4A or less for the 8 hour timer, it will transition to Standby Mode.
- Standby Mode** In the Standby Mode, the Charger is OFF but monitors the battery voltage. If battery voltage drops below 12.5 Vdc, the unit will start a new Bulk stage.

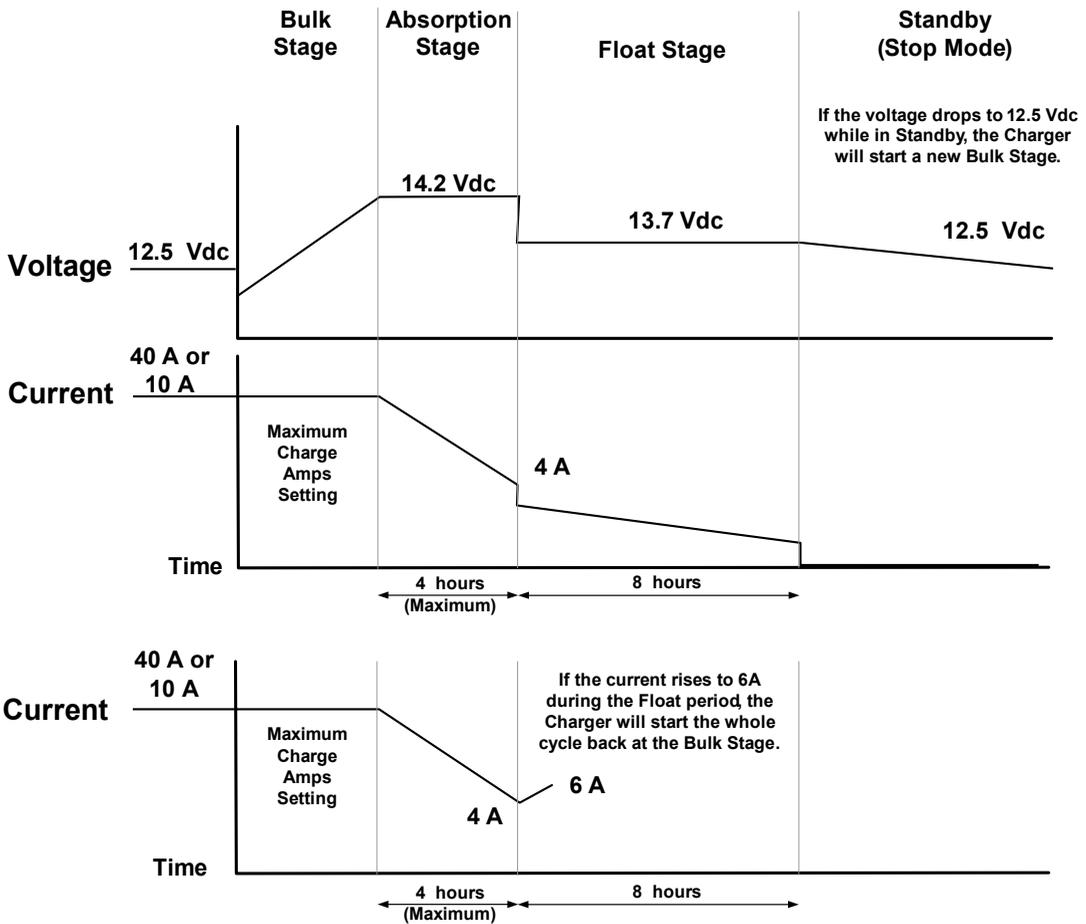


Figure A-1 Three-Stage Charging Process

Charging Profiles

40-amp Charging Profile

Table A-5 provides the specific charging parameters for the 40 Charging Profile.

Table A-5 40-amp Charging Profile

| Parameter Name | Default Value |
|--|--|
| Charger Setting | 40 A |
| Maximum Bypass Current | 500 W (4 A) |
| Bulk Mode | 40 A |
| Absorption Mode | 14.2 Vdc (4 hours maximum) |
| Float Mode | 13.7 Vdc (8 hours) |
| Switches from Absorption to Float Mode | 4 A |
| Switches from Float Mode back to Bulk Mode within the 8-hour limit, if the Float current increases to 6 A. | 6 A |
| Standby Mode (Off Mode) | 12.5 Vdc |
| Estimated charging time | 8 hours based on a single battery box with two 100 Ah, 12 Vdc batteries and no other DC charging sources |

10-amp Charging Profile

Table A-6 provides the specific charging parameters for the 10 Charging Profile.

Table A-6 10-amp Charging Profile

| Parameter Name | Default Value |
|--|---|
| Charger Setting | 10 A |
| Maximum Bypass Current | 1200 W (10 A) |
| Bulk Mode | 10 A |
| Absorption Mode | 14.2 Vdc (4 hours maximum) |
| Float Mode | 13.7 Vdc (8 hours) |
| Switches from Absorption to Float Mode | 4 A |
| Switches from Float Mode back to Bulk Mode within the 8-hour limit, if the Float current increases to 6 A. | 6 A |
| Standby Mode (Off Mode) | 12.5 Vdc |
| Estimated charging time | 32 hours based on a single battery box with two 100 Ah, 12 Vdc batteries and no other DC charging sources |

0-amp Charging Profile

When Charger Setting 0 A is selected, the Battery Charger is disabled and will not charge the batteries. Use this mode if other DC charging sources are available or if it is necessary to temporarily disconnect the AC charging system.

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